

UNITED STATES MARINE CORPS
Basic Officer Course
The Basic School
Marine Corps Combat Development Command
Quantico, Virginia, 22134-5019

B1450

WATER, VEGETATION, AND MANMADE FEATURESStudent Handout1. **Water Features**a. Types of streams or lakes

- (1) Perennial streams or lakes contain water more than six months of the year.
- (2) Intermittent streams or lakes contain water less than six months of the year.

b. Seasonal characteristics of streams or lakes

(1) Perennial

(a) During the wet season, perennial streams or lakes contain much water, with possible overflow.

(b) During the dry season, perennial streams or lakes may contain little or no water.

(2) Intermittent

(a) During the wet season, intermittent streams or lakes may look like perennial features.

(b) During the dry season, intermittent streams or lakes will probably contain little or no water.

c. Regional characteristics of streams or lakes

(1) In a humid region, most streams or lakes are perennial. Some smaller stream or canal branches may not be shown on the map.

(2) In a semi-arid/arid region, most streams or lakes are intermittent. As many perennial and intermittent features as possible are shown on the map.

d. Using season and region as clues to associate terrain with a corresponding map

(1) Generally, if a feature contains water during the dry season (when you would least expect to find water), you can assume that it is a perennial water feature. This is especially true in arid and semi-arid regions.

(2) Generally, if a feature contains no water during the wet season (when you would expect to find water), you can assume that the feature will be portrayed on the map as an intermittent water feature. Again, this is especially true in arid and semi-arid regions. In a humid region this feature may not be portrayed on the map at all.

e. Map design characteristics and criteria

(1) Perennial streams and canals (canals are manmade and, thus, have straighter edges) are depicted differently, according to their width.

(a) If less than 25m wide, a perennial stream or canal is shown by a dark thick blue line.

(b) If greater than 25m wide, a perennial stream or canal is shown by a blue tint between dark thick blue lines. The actual width is portrayed as accurately as possible.

(2) Intermittent streams, regardless of width, are shown by a thin light blue line. On older maps,

intermittent streams may be portrayed by broken blue lines.

- (3) Islands are outlined with a blue line and placed on the map if larger than 50m by 50m in area.
- (4) Only waterfalls and rapids that affect travel are shown on the map.
- (5) Sand is shown on a map if it covers an area larger than 50m by 50m.
- (6) In a humid region, other water features such as lakes, dams and marshes are shown if they are larger than 50m by 50m.
- (7) In arid or semi-arid regions as many water features as possible are shown.

2. Vegetation

a. Types of vegetation

- (1) Annual vegetation is not shown on a map. It dies at the end of the growing season.
- (2) Permanent vegetation is the only vegetation shown on a map. In order to be shown, it must cover an area of at least 50m by 50m and 20 percent of the ground in density. There are five types of permanent vegetation.
 - (a) Woodlands. This is a stand of trees at least three meters in height that covers 50-100 percent of the ground in density.
 - (b) Scattered trees. These are trees at least three meters in height that cover only 25-50 percent of the ground in density.
 - (c) Scrub. This term applies to vegetation up to three meters in height.
 - (d) Orchards. These are trees planted in rows.
 - (e) Vineyards. These are vines supported by a trellis or post and planted in organized rows.

b. Effects of season

- (1) During the fall and winter, some permanent vegetation loses its foliage and annual vegetation dies.
- (2) During the spring and summer, annual vegetation grows. Vegetation as a whole appears thicker.

c. Effects of region

- (1) Humid region. Vegetation is tall and dense.
- (2) Semi-arid/arid region. Vegetation is shorter and less dense.

d. Summary of vegetation types by density, height, and permanence. The following figure is a matrix showing how vegetation is classified. Only permanent vegetation is shown on maps. Woodlands and scattered trees are growth over three meters in height. Within these categories there can be a broad variation in appearance. For example, woodlands may be rain forests or coniferous forests. If vegetation classified as scrub reaches a height of over three meters, it will be reclassified as woodland or scattered trees depending upon its density. Annual vegetation can be quite dense but, because it is not permanent, it is not shown on maps.

3. Manmade Features

a. Considerations

- (1) The symbols for most manmade features are found in the map legend.
- (2) Magnitude shows the relative size, use, or permanence of related features.

b. Types

WATER, VEGETATION, AND MANMADE FEATURES

- (1) Roads are shown with a variety of reddish-brown or black lines.
 - (a) Symbols vary with the type of surface.
 - (b) All paved roads in the real world are shown on the map.
 - (c) Dirt roads that are the only route to a mapped feature are shown on the map.
- (2) All railroads are shown on the map.
- (3) Bridges that are longer than fifty meters are shown on the map.
- (4) Power transmission lines are shown if they do not clutter the map.
- (5) All airfields are shown on the map: a dirt or grass surface is shown with dashed black lines and a paved surface with solid black lines.
- (6) Buildings larger than 25m by 25m will have their exact size and shape shown. All buildings which are widely spaced are shown individually if they do not clutter the map. If buildings are close together only some of the buildings are shown.

4. **Using Water, Vegetation, and Manmade Features as Aids to Navigation**

- a. Be aware of the date of the map. The information the map provides is only as good as the date it was compiled.
- b. Look for unique features such as power lines, lakes, prominent stands of vegetation, etc.
- c. Confirm suspected location by matching the terrain seen in the real world with that depicted on the map. Actual landforms rarely change: beavers can create ponds, man can cut down woodlands and destroy buildings, but it is a rare event that alters landforms--the dirt won't lie!

REMINDER! Anytime you begin to match the map with the terrain around you, first orient the map either visually or by using a compass. To orient a map utilizing a lensatic compass, simply place the straight edge of the compass on a north/south grid line (ensuring the compass cover is toward the north) and rotate the map until the compass face matches the declination diagram.

5. **Summary**

- a. Using water, vegetation and man-made features to aid in navigation is an advanced technique which, when practiced repeatedly, can enhance one's abilities. It is the final step in completing terrain association measures while navigating.
- b. Do not forget, though, that water, vegetation, and man-made features are also defined as terrain features on a standard military map.

APPENDIX AREQUIREMENT 1

Map: Margarita Peak, California, 1:50,000, Sheet 2550 IV, Series V795, Edition 8-NIMA

1. You are somewhere in the four grid square area defined by grids 6095, 6195, 6094, and 6194. You are on a piece of high ground at its highest point. There is an unimproved surface road directly to the east. The ground to the west falls off to form a fairly large finger. There are smaller fingers to the north and south. In addition, you can just make out, in the distance, a control tower in GS 6389 on a magnetic azimuth of 145°. What is the 8-digit grid coordinate of your position?
2. You are somewhere in the four grid square area defined by grids 6888, 6988, 6887, and 6987. It is springtime, and by the relative "greenness" of the vegetation, you note the area has received adequate rainfall. You are standing in a dry streambed that is 40m wide. There is very little vegetation around you. To the north you see a road running at a slight angle (SE->NW) to your front. In the background, to the northeast, you see the top of a huge building that you estimate to be approximately 500m from your location. To the west you can see ground rising away from you some distance (approximately 300-500m) away. To the south you see a dirt road running from the southwest to the northeast (SW->NE) with a body of water behind it. What is the 6-digit grid coordinate of your position?
3. You are somewhere in the four grid square area defined by grids 5998, 6098, 5997, and 6097. It is mid summer. The area around you has been blackened by a recent fire. You are standing in a dry streambed which runs from the southwest to the northeast (SW->NE) on a rough magnetic azimuth of 15°. To the west is a somewhat concave slope of considerable size. There is a considerable draw which runs to the east at roughly a 90° magnetic azimuth. Due to the lack of vegetation, you can look north along the stream for a considerable distance and you notice a fairly steep concave slope on the east side of the stream about 300m north of your position. The stream continues south at roughly a 190° azimuth. There is considerable high ground to the west and east. From the description given, what is the 6-digit grid coordinate of your position?

REQUIREMENT 2

Map: Quantico, 1:50,000, Sheet 5561 III, Series V734, Edition 6-DMA

1. You are somewhere in the four grid square area defined by grids 9268, 9368, 9267, and 9367. You are in a relatively small dry streambed in mid spring. The streambed runs from the northwest to the southeast (NW->SE). About 50m downstream you can see where the streambed joins a larger stream. As you look upstream, you notice that about 100m upstream the streambed takes a fairly abrupt turn to the north. Again looking upstream, you notice a piece of high ground to your left with comparatively lower ground to your right. Looking downstream, you notice that directly across from the point where your streambed intersects with the larger stream, there is a fairly distinct draw that climbs up to the southeast and divides two distinct pieces of terrain. From where you are, it looks like the draw may define a saddle. What is the 6-digit coordinate of your position?
2. You are somewhere in the four grid square area defined by grids 9374, 9474, 9373, and 9473. It is mid spring following a recent rain. You are in a small stream that flows from the northeast to join Quantico Creek approximately 75m to your southwest. As you look upstream, you notice the stream runs down a fairly significant draw that bends to the northeast as far as you can see. As you look to the southwest across Quantico Creek, you notice that the ground has a definite rise to it and results in a slightly convex slope of some magnitude. You also notice a small draw almost directly across Quantico Creek from your position. What is the 6-digit grid coordinate of your position?
3. You and your platoon have just been inserted via helo into a small clearing. You are unsure of your location. What you do know is that you were picked up at LZ 6 in the vicinity of grid 87406373 and were flown on a magnetic azimuth of 013° for 6 minutes at 120 knots (nautical miles per hour). During the pilot's brief, you learned that winds aloft were negligible and would not affect navigation. (Don't be intimidated by any of this. With what you've been taught, you have enough tools to figure this one out. Once you determine your probable location, assume your actual drop-off point is anywhere within 1000m of the point you've identified on the map.) It is mid summer and there has been little rain. Although you tried to terrain associate during the flight, it was your first experience with aerial navigation and you quickly lost track. You are on a large finger that points almost due north. There is a small stream to the west that defines the finger. To the east is a dry streambed that also defines the finger. To the immediate west is a significant draw which cuts down the side of the finger on a magnetic azimuth of approximately 296°. To the southeast of your position is another draw which initially runs to the southeast but, after approximately 150m, makes a sharp turn to the northeast. The slopes to the west and east down the finger appear to be convex. What is the 6-digit grid coordinate of your position?

REQUIREMENT 1 SOLUTION

1. 61359570
2. 692886
3. 600984

REQUIREMENT 2 SOLUTION

1. 931675 ± 100m. The first step in determining your position is to begin ruling out potential streams. The streambed is dry even though it is mid spring, the wet season. This should pretty much rule out all perennial streams and perhaps some of the smaller intermittent ones. As this is a humid region, not all streams will be shown on the map (as in this case). Realizing this, you determine that only a draw will be shown. This fact, combined with your other clues (your observations) should be enough to pinpoint your location. No other stream intersection matches all the clues provided.

2. 942745 ± 100m. As in the previous problem, because you are in a humid region you must determine which stream will probably be seen in the real world and on the map. Because it is in the wet season, following a rain, in a humid region you should realize that practically every draw will have at least a small stream running down it. Hence, you should know from the outset that you are looking for a draw on the map that runs from the northeast to the southwest (NE->SW) to join up with Quantico Creek. From the description provided, there can only be one possible position.

3. 894861 ± 100m. OK, this is a complex problem. Take it one step at a time.

a. You must first determine the location of LZ 6 on your map. Simply reconstruct the grid square.

b. Next, the problem gives you an azimuth, a flight speed and a time of flight. From the latter two pieces of information you can determine distance. Here's how to set this up:

Speed of aircraft = 120 knots (= nautical miles per hour). Time of flight = 6 minutes

Set up: $X = \frac{120 \text{ nautical miles}}{1 \text{ hour}} \times 6 \text{ minutes}$

Substitute: $X = \frac{120 \text{ nautical miles}}{60 \text{ minutes}} \times 6 \text{ minutes}$

Simplify: $X = \frac{120 \text{ nautical miles} \times 6 \text{ minutes}}{60 \text{ minutes}}$

Solve: $X = (2 \times 6) \text{ nautical miles}$
 $X = 12 \text{ nautical miles}$

c. Now, using your ruler and the graphic scale on your map, convert the nautical miles to meters, draw a line from LZ 6 on the azimuth provided, and extend it for approximately 22,550m.

d. The hard part is over. Look for a finger pointing north. There's only one within 1000m of the end of your line. Now, utilizing the clues provided, simply match the description with the map.

e. This problem was written not only to test your mastery of most of the techniques taught during the land navigation package, but also to make a point. As a "Leader of Marines" you are responsible for getting your unit to the right spot on the ground. If you are on foot, it is totally up to you. When you are helo inserted onto a piece of ground, like it or not, unless you have a lot of experience, you will be forced to rely upon the abilities of the pilots to get you where you want to go. Aviators, after a beer or so, will generally confess to being able to get you to within 1000m of your intended drop-off point. Although initially this sounds terrible, after considering the distances involved, not to mention the enemy threat, it isn't really that bad. Although the best option is not to lose track of the helo's position during the flight, don't sweat it if after debarking the bird, you figure out somebody made a mistake. Look at the terrain and find the point on the map that matches your position. Just relax and take it step by step.

FEATURE	REGION	SEASON
Perennial Streams (Contain water more than six months of the year)	HUMID	WET - Streams are full. Banks overflow a heavy rains.
		DRY - Stream level is lower than wet season still filled with water year round.
	SEMI-ARID	WET - Streams contain flowing water.
		DRY - Streams still flow but are reduced to minimum levels.
	ARID	WET - Streams flow at least six months a year, at a minimum level.
		DRY - Streams are reduced to streambeds which be dry or have small trickles. There some growth in the wettest areas.
Intermittent Streams (Contain water less than six months of the year)	HUMID	WET - Streams fill banks after heavy rains. look like perennial streams in the season.
		DRY - Water still flowing, although level reduced from the wet season.
	SEMI-ARID	WET - Streams flow with little water. Occasional floods.
		DRY - Little water in puddles. Little flow.
	ARID	WET - Little water except for floods after rains.
		DRY - No water. Bed may be damp.

VEGETATION TYPE	DENSITY		HEIGHT (Less than 3 meters)	PERMANENCE
	20% or more	50% or more		
WOODLANDS		X		X
SCATTERED TREES	25%-50%			X
SCRUB	X		X	X
ORCHARDS	X			X
VINEYARDS	X			X
ANNUAL VEGETATION	NOT SHOWN ON MAP			